

CLAIMS

What is claimed is:

1. An electrochemical battery comprising at least two electrically interconnected electrochemical cells, each electrochemical cell comprising:
an anode comprising carbon;
a cathode comprising a modified lithium metal oxide including at least one
5 additional element selected from the group consisting of nickel, aluminum, magnesium, titanium, and combinations thereof; and
a Schottky diode connected between the anode and the cathode.
2. The battery of claim 1, wherein the at least one additional element comprises nickel.
3. The battery of claim 1, wherein the at least one additional element comprises nickel, and the modified lithium metal oxide further comprises cobalt.
4. The battery of claim 1, wherein the at least one additional element comprises nickel and aluminum.
5. The battery of claim 1, wherein the anode comprises
a copper anode current collector, and
carbon particles supported on the anode current collector.
6. The battery of claim 1, wherein the cathode comprises
an aluminum cathode current collector, and
modified lithium metal oxide particles supported on the cathode current
collector.
7. The battery of claim 1, wherein the separator comprises
a layer of microporous polyvinylidene fluoride.

8. The battery of claim 1, wherein the electrolyte comprises a mixture of an electrically conductive lithium salt and an organic carbonate.

9. The battery of claim 1, wherein
the anode, the cathode, and the separator are planar and are rolled into a
5 spiral.

10. The battery of claim 1, wherein
the anode, the cathode, and the separator are planar and are shaped into a
prismatic form.

11. The battery of claim 1, wherein the modified lithium metal oxide
comprises a combination of elements selected from the group consisting of
lithium nickel oxide, lithium nickel aluminum oxide, lithium nickel cobalt oxide,
lithium nickel cobalt oxy-fluoride, lithium nickel cobalt aluminum oxide, lithium
5 nickel cobalt iron oxide, lithium nickel cobalt manganese oxide, lithium nickel
cobalt manganese aluminum oxide, and lithium nickel cobalt titanium magnesium
oxide, and combinations thereof.

12. An electrochemical battery comprising at least two electrically
interconnected electrochemical cells, each electrochemical cell comprising:
an anode;
a cathode comprising a cathode active material which exhibits a full-
5 discharge cell potential that is more negative than a negative bypass voltage; and
a cell current bypass connected between the anode and the cathode, the cell
current bypass conducting current between the anode and the cathode to short
circuit the electrochemical cell only at voltages more negative than the negative
bypass voltage.

13. The battery of claim 12, wherein the cathode active material
comprises a modified lithium metal oxide including at least one additional

element selected from the group consisting of nickel, aluminum, magnesium, titanium, and combinations thereof.

14. The battery of claim 12, wherein the cell current bypass comprises a Schottky diode.

15. A method of operating a battery system, comprising the steps of providing an electrochemical battery comprising at least two electrically interconnected electrochemical cells, each electrochemical cell comprising:

an anode comprising carbon,

5 a cathode comprising a modified lithium metal oxide including at least one additional element selected from the group consisting of nickel, aluminum, magnesium, titanium, and combinations thereof, and

a Schottky diode connected between the anode and the cathode;

fully discharging the battery; and thereafter

10 operating the battery in a series of charging and discharging cycles.

16. The method of claim 15, wherein the at least one additional element comprises nickel.

17. The method of claim 15, wherein the at least one additional element comprises nickel, and the modified lithium metal oxide further comprises cobalt.

18. The method of claim 15, wherein the at least one additional element comprises nickel and aluminum.